critical frost dates is their extreme irregularity. Thus at Peoria, Ill., with a fifty-nine years' record, the latest frost in spring covers a period of nearly fifty days, and the earliest in autumn a period of forty days. The maps are based upon the average dates.

The mountainous character of the country in the western portion of the United States, and the fact that the stations are mostly situated on the lower slopes of the mountains, make mapping very difficult, and it is pointed out that only a general idea of the conditions can be given. For practical purposes this position of the stations should not matter, as they would naturally be in those parts where cultivation was most prevalent.

It appears from the maps that there is no part of the United States except Key West where a frost may not occur, and the line showing a frost in half the years—that is, the line showing the position where a frost is just as likely to occur once in the winter as not to occur—excludes only a small part of Florida and reaches down to latitude 26° N. The line for the last frost before March 1 cuts off the peninsula of Florida and fringes the southern coast as far as New Orleans. In the north frosts are common until the middle of May or even June 1, and in the higher parts of the west, which are only used for grazing, they occur after June 1.

The earliest frost in autumn does not occur until after December 1 in Florida and in parts of the south-west. On the north-western frontier frost may be expected about the middle of September. About one-quarter to one-third of the whole country has a period of 210 consecutive days free from frost, but in the mountainous regions of the west there is a good deal of country in which the period is barely half as long.

Some smaller maps give information as to the frequency of frosts in the different districts one, two, or more weeks before or after the average dates. The whole paper is most interesting, and should be very useful to agriculturists in the United States. W. H. D.

NOTES.

THERE was a certain inevitableness in the nomination of Mr. Arthur James Balfour for the Chancellorship of Cambridge University. The fact that Mr. Balfour has consented to be so nominated in succession to his late brother-in-law has everywhere been received with enthusiasm. In the history of Cambridge, statesmen, administrators, literary men, and philosophers have succeeded one after another in the roll of Chancellors, but in Mr. Balfour, the most celebrated of living graduates of Cambridge University, all are combined in one man. Mr. Balfour is one of the two honorary fellows of Trinity College, the other being the Right Hon. G. O. Trevelyan. Mr. Balfour was educated at Eton, and entered Trinity College in the late 'sixties. He took his degree in the Moral Sciences Tripos of 1896, in the same year as Dr. Percy Gardner, now the professor of archæology at Oxford The Balfour family has been most intimately associated with Cambridge; his younger brother Francis, who unhappily perished in the Alps in 1882, was a man of the highest scientific distinction, one who was leading zoologists along new lines of thought; another brother, Gerald, was a fellow of Trinity; one of his sisters married Prof. Henry Sidgwick, and was for many years Principal of Newnham College; and another sister married Lord Rayleigh, whose recent death has deprived the University of a generous Chancellor and a great pioneer in modern physics. A reference to "Who's Who" will show not only the list of honorary degrees, too long to be quoted here, which have been conferred upon Mr. Balfour, but also that he has constantly taken the lead on various boards and committees connected with education. He has been Lord Rector of St. Andrews University, Lord Rector of Glasgow University, and he is Chancellor of Edinburgh University. The announcement that so distinguished a man and scholar has consented to be nominated for the post of Chancellor has met with widespread sympathy and hope amongst the members of the Senate.

ENTOMOLOGISTS, it appears, have not yet solved the problem of what becomes of the house-fly in winter-time. The popular idea that when the cold season comes the house-flies, or such of them as do not die off, retire to some quiet nook or cranny in the house and, like dormice, sleep undisturbed through the winter is still entertained in some scientific and other respectable quarters, although no trustworthy evidence has been found to support it. There are flies and flies; and, as Dr. L. O. Howard was, we believe, the first to suggest, no evidence relating to the hibernation of the house-fly can be trusted until it has first been submitted to expert examination. Since that suggestion was made, a large amount of evidence has been submitted to experts, and now they are almost unanimously agreed that the hibernating house-fly is a wholly mythical creature. But the house-fly must get through the winter somehow, and if not in its perfect state as a fly, then in some other stage or stages of its life, or else we should not be troubled with the pestilent brood year after year in succession. Before the entomologist can tell us exactly how, it looks as if he will need the help of the sanitary officer, the stable-boy, the farm labourer, or even of the Boy Scout, rather than that of the ordinary householder. The search for larvæ and pupæ of the fly is not an easy one, and often involves a great amount of physical labour. In summer-time the pupæ are frequently to be found living at a depth of 2 ft. under the surface of the soil within half a yard of a manure heap. Dr. Gordon Hewitt has searched for them in such places, and in every other likely place, in winter-time, and has never succeeded in finding any alive. But because he, and possibly a few others, have made it and failed, it can scarcely be said that a search of that kind has been exhausted, and that we must fall back upon the hibernating adult fly as the only alternative. There may be no definite hibernating stage in the life of the fly. The insect may continue to breed in the winter, not exactly as it does in the summer or autumn, but at a greatly retarded rate, each stage being more or less prolonged. This probably does not happen to any extent under natural conditions in this country, but the number of places in which it can happen, and probably does happen, under special conditions may be quite sufficient to account for the perpetuation of the fly.

THE officers and other members of council of the Röntgen Society for the session 1919–20 are as follows:—*Pesident:* Dr. Sidney Russ. *Hon. Secretaries:* Dr. Robert Knox and Dr. R. W. A. Salmond. *Hon. Treasurer:* Mr. Geoffrey Pearce. *Hon.*

Editor: Major G. W. C. Kaye. *Council:* Mr. W. E. Schall, Dr. G. H. Rodman, Mr. C. Howard Head, Mr. C. R. C. Lyster, Dr. J. Metcalfe, Mr. E. P. Cumberbatch, Dr. A. E. Barclay, Mr. F. J. Harlow, Dr. W. Makower, Dr. E. A. Owen, Mr. J. Russell Reynolds, and Mr. R. S. Wright.

A congress attended by 350 persons met at Marseilles in January last, under the auspices of the local Chamber of Commerce, to discuss and emphasise the rights of France over Syria. The discussions of the congress were divided into four sections:—Economics, archæology and history, education, and medicine and hygiene. A summary of the main papers of geographical interest is given in *La Géographie* (vol. xxxii., No. 5). M. E. de Marbonne contributed a paper on the geographical unity of Syria, in which he showed that Syria cannot be divided latitudinally, but that the natural divisions of the country extend from north to south, and are separated approximately by meridians from the Mediterranean to the valley of the Euphrates. Various papers of considerable value, although from a distinctive point of view, dealt with the trade and ports of Syria.

At the instigation of the Admiralty, the Royal Geographical Society has taken steps to form a permanent committee on geographical names, on which the Admiralty, War Office, Foreign Office, Colonial Office, India Office, Post Office, Board of Trade, Board of Agriculture, and the Royal Geographical Society are represented The chairman of the Committee is Major-Gen. Lord Edward Gleichen, and Mr. A. R. Hinks is acting povisionally as secretary. The Committee hopes eventually to examine all cases of doubtful nomenclature and spelling in the place-names of the British Empire, accepting, wherever possible, official name-lists such as those provided by the Gazetteer of India, the Board of Geographic names of Canada, etc. Place-names of the British Isles are outside the scope of the Committee, as they are dealt with by the Ordnance Survey. Lists of names will be published at intervals after they have been submitted for approval to the authorities of the country concerned. Correspondence regarding confused or doubtful place-names of which the writer has personal knowledge is invited, and should be addressed to the Secretary, Committee on Place-Names, c/o Royal Geographical Society, Kensington Gore, London, S.W.7.

The Journal of the Royal Microscopical Society for June (part 2, 1919) contains an important paper by Mr. J. Brontë Gatenby on the identification of intracellular structures. Considerable difficulty is often experienced in distinguishing several categories of cell elements. The Golgi apparatus, mitochondria, yolk, and fat are, or contain, substances often identical and generally chemically allied. For this reason care must be exercised in any attempt to identify a given cell body, and it is clearly recognised that the mixture of two or more of the above-mentioned elements may lead to confusion. The characteristics of the various elements of the cell which the zoologist may meet with, and the manner in which they may be distinguished by staining methods and micro-chemical tests, is indicated in tabular form.

The Review of Work in 1918 of the Rockefeller Foundation has recently been issued. The activities of the foundation include a campaign against tuberculosis in France, which is mainly engaged in co-ordinating the various agencies already in existence for combating this disease. Demonstrations to test the possibility of ridding a community of malaria by anti-mosquito measures have been carried out in Arkansas with considerable success, and an epidemic of yellow fever in Guatemala has been stamped out. Measures for the control and prevention of hook-worm disease have been undertaken in many tropical countries. Medical education is also encouraged by the foundation; the Pekin Union Medical College is being built under its auspices, and grants are made to many missionary hospitals. The total disbursements of the foundation for 1918 amounted to more than 15,000,000 dollars, and war-work expenditure during the war totals nearly 22,500,000 dollars.

In an article published in a recent issue of the *North China Daily News* Mr. Austin J. Clements estimates that to maintain the trade in musk which passes across the Szechuan-Tibetan border, about 100,000 musk-deer must be captured and killed each year. The quantity of musk brought into Tachienlu, the chief centre of the trade, shows no sign of diminution, so that apparently the annual drain, large as it is, has so far had no noticeable effect on the musk-deer population of Eastern Tibet. Mr. Clements thinks it may be feasible to rear musk-deer in semi-captivity, and to collect musk from the animals without killing them. The wholesale slaughter which now goes on is largely unnecessary, since the snaring methods employed lead to the destruction of large numbers of females and immature males, whereas only male deer more than three years of age secrete musk. The article contains a good deal of information regarding the trade in musk, not the least interesting item being the statement that one firm in Tachienlu devotes itself solely to the manufacture of an adulterant, which resembles true musk in all respects save smell, the latter being provided by the addition of a small quantity of genuine musk. In coping with this and other less ingenious forms of sophistication the Chinese merchant is accustomed to rely on his personal judgment of the appearance, taste and smell, etc., of the article offered to him, so that it is not surprising that some authorities believe that all the musk exported from Tachienlu is more or less adulterated.

In connection with the Rat Exhibition held a few months ago in the gardens of the Zoological Society of London, special investigations were made into the various methods of rat destruction. Mr. E. G. Boulenger was placed in charge of this research, and on September 26, in a lecture presided over by Prof. E. W. MacBride, and attended by a large gathering of medical officers of health, sanitary officers, and rat officers, he gave an account of the results obtained. He stated that in the course of his investigations it was ascertained that, not only had the common brown rat very greatly increased in numbers in recent years, but also that the old English black rat, or ship's rat, which was supposed to have been practically exterminated in this country by the commoner species, and to be restricted to ports and ships, had become much more abundant, and the two species of rats were now found in various parts of London living together in harmony. Where rats were present in large numbers, and where it was not practicable to use gas, poisoning was found to be the best and cheapest method to adopt for their destruction. Of all the poisons experimented with, squill, the extract of the bulb of the Mediterranean plant *Scilla maritima*, gave the greatest satisfaction. Good results were also obtained with barium carbonate. Both these poisons, Mr. Boulenger said, were in the small quantities required to kill rats and mice, more or less harmless to domestic animals. The destructive power of virus was found to be more untrustworthy than that of some poisons. The most successful form of trap consists of a tunnel-shaped cage with open doors at each end, which shut when the rat treads on a platform in the centre of the passage. The common steel gin-trap was specially successful when covered with wire tunnels. A large number of experiments were conducted in order to ascertain whether there was any truth in the statement that rats are influenced by human odour. As a result of these experiments it was found that it was superfluous to avoid handling traps on the assumption that rats are detracted by the odour of man. Sulphur dioxide was found to be the most effective gas, and was recommended for killing rats on ships and in confined spaces. When driven off under pressure, the gas could be used with success in fumigating rat-holes in the open. Details of the research will be found in a "Report on Methods of Rat Destruction," by Mr. E. G. Boulenger, shortly to be published by the Zoological Society, price 6*d*.

The Proceedings of the United States National Museum (vol. lvi., No. 2288) contains an interesting paper entitled "Descriptions of New Species of Molluscs of the Family Turritidæ from the West Coast of America and Adjacent Regions" by Dr. W. H. Dall. In all, somewhat more than 200 species are considered, of which 181 are new. Of this large number 93 belong to the fauna of the western coast of the United States from the Arctic Ocean to San Diego, California, including one species from Hawaii. Eleven species appertain to the west coast of South America, including the Galapagos Islands; 89 belong to the Panamic fauna and its extension into the Gulf of California. The new species are well figured on twenty-four plates reproduced from excellent microphotographs.

During the early days of rubber-planting, seed was put in regardless of its origin, whether from trees yielding large or from trees yielding small quantities of latex. Now, however, so much rubber is planted that there is danger of over-production, and for further plantations (now that capital costs have increased) to have much chance of success they should be planted with seed from the best bearers. Selection of seed is already in progress in Ceylon and elsewhere, and a paper by Whitby ("Variation in *Hevea brasiliensis*," *Ann. of Bot.*, vol. xxxiii., 1919, p. 313) provides useful data which give an idea of the possibilities of improvement in average yield. A large number of trees were tapped on a uniform system (in Malaya), and it was found that nearly 10 per cent. yielded twice the mean or more. If, then, the method of selection indicated in Lock's "Rubber and Rubber-Planting" (p. 101) were adopted, there seems good reason to hope that new plantations might be made yielding much more rubber per acre than the old.

The possibilities of camphor cultivation in the West Indies has recently been discussed in the *Agricultural News* for May 31 last. The decreasing amount of camphor available for export from Japan, which has hitherto been the main source of supply, has led to experimental growth of the camphor-tree in various West Indian Islands. It has been found that some varieties of the tree yield oil only, while others yield camphor and oil, and this important botanical aspect of the question is being investigated at Kew. With the right variety, the leaves and twigs, as well as the wood and roots, are found to yield camphor on distillation, and the trees will bear severe pruning with little apparent injury. Camphor production appears to be an industry which might profitably be developed in several West Indian islands, where climatic and soil conditions are suitable; for instance, Jamaica, Trinidad, Dominica, and others. Camphor hedges as wind-breaks to lime or cacao plantations might be experimented with, even if extensive areas were not devoted entirely to camphor plantations.

Among recent publications of the Board of Agriculture is the first annual report of the Flax Production Branch—a branch formed in 1917 to arrange for the growth of at least 10,000 acres of flax in Great Britain. It is estimated that the 1918 crop will yield about 26,500 tons of straw and seed. The cost of production has been enormous, chiefly owing to the great difficulty in obtaining the large amount of labour necessary for harvesting the crop. Pre-war experiment stations proved the possibility of flax production on a small scale in Great Britain, but it would be obviously unfair to take last year's experience as a guide to the possibility of a large-scale flax industry. The latter will depend on foreign imports and prices, on the development of flax-growing in other countries, and also on the hitherto unattacked problem of the reduction of costs in all the stages of production. Improvements already in sight are the increased straw yield from selected strains, and the progress made with the threshing attachment which makes de-seeding on the farm possible. Also, it must be remembered that, failing the large-scale establishment of the flax industry, considerable loss will be sustained in the disposal of the machinery which has been put up during the past year.

The recently issued volume of the Journal of the Royal Agricultural Society (vol. lxxix., 1918) contains several papers of great interest in connection with the food production campaign carried on during the war. Prof. Bryner Jones describes the results of breaking up grass-land in 1918. This will always rank as one of the most remarkable achievements of British agriculture, contributing as it did so largely to the food-supply of the country in times of great need. It was fitting, therefore, that the technical problems should be recorded and discussed. Teachers and experts will hope that an even fuller account may be published eventually, giving details of soil formations and conditions that will add to its usefulness. Mr. Garrad describes the work of the tractor on the farm. This implement is rapidly revolutionising farm conditions, and is greatly increasing the efficiency of the farm-worker. The defects of present types are set out and suggestions made for the consideration of engineers. Unfortunately, the great enemy of the tractor is the weather; in Mr. Garrad's opinion, it is essentially a fine-weather machine, and has to be laid up in winter. But it works so quickly that it enables a farmer to do much of his work during the fine periods. Mr. J. R. Bond gives an account of modern haymaking machinery, and Mr. Arthur Amos discusses the difficulties of growing red clover.

The Rev. M. Saderra Masó, who has studied the seismic and volcanic phenomena of the Philippine Islands for many years, has recently published the catalogue of earthquakes for the year 1918 (U.S. Weather Bulletin for December, 1918). Excluding after-shocks, the total number of earthquakes is 167, three of which were recorded all over the world. The most important earthquake was that which occurred in Southern Mindanao on August 15 at 12.20 p.m., G.M.T., its epicentre being in 5·5° N. lat. and 124·5° E. long. This shock, the intensity of which reached the highest degree (10) of the Rossi-Forel scale, was followed by thousands of after-shocks (some of them of degrees 7 and 8) during the months of August, September, and October. It was followed by a sea-wave, which swept over the southern coast of Catabato, causing great damage and loss of life. About a month later, on September 13, there were two violent shocks in the Batanes Islands, the first of intensity 8 at 6.56 a.m., the second of intensity 9 at 11.5 a.m., by which the towns of Sabtan and Ivana were destroyed.

THE Bulusan volcano rises on the south-east end of the island of Luzon to a height of about 5000 ft. For centuries—indeed, so far back as the historic record extends—it has been dormant, only occasionally ejecting small jets of steam from numerous vents around its breached and nearly filled-up crater. A few light outbursts with ejection of ashes are reported as having occurred in 1852, 1889, and 1894. Far more important were the eruptions which took place in January, 1916, and October, 1918, and are briefly described by the Rev. M. Saderra Masò in the U.S. Weather Bulletin for January last. The first began on January 16, 1916, and lasted five days, with numerous earth-tremors and rumbling noises and small explosions. The eruption of October, 1918, was more violent, and at the end of December incandescent lava began to pour down a deep ravine on the south-south-west side of the mountain, continuing until the end of March, 1919. The damage caused by the eruptions is of little account; indeed, the plantations on the lower flanks of the volcano have been benefited by the small falls of ashes.

Symons's Meteorological Magazine for September inaugurates the passing of the magazine from the British Rainfall Organisation to the Meteorological Office as a part of the unification of the British Meteorological Services. The Thames Valley rainfall map for August shows the general rains to have ranged during the month from 2 in. to 4 in., the rains being heaviest in the southern districts of Hampshire and Sussex. In London and over a large part of Middlesex the rains measured about 2·5 in., the least rains amounting to 2 in. and less over the estuary of the Thames.

THE Monthly Meteorological Chart of the North Atlantic Ocean published by the Meteorological Office, in addition to the usual information dealing with matters of especial interest to the seaman, has on the face of the chart a note on the increasing storm tendency during the autumn. Attention is directed to the fact that during the winter half of the year both anticyclones and cyclones are of greater intensity than those of the quieter months of summer, the barometer during the winter season both rising higher and falling lower, which accounts for the greater severity of the wind. As an illustration of the irregular track of storms at times, attention is directed to a storm experienced by H.M.S. *Caesar* in the neighbourhood of Bermuda during the early days of September, 1915, when the storm's path seems to have nearly completed a circle and then to have doubled back over a considerable area. To confirm so erratic a path, a minute discussion of neighbouring and surrounding observations seems desirable. Autumn is referred to as the most stormy period for hurricanes in the tropical belt, but the accumulated data for many years show August as the most stormy month for West Indian hurricanes. Charts are given of the North Polar seas for the months from April to August inclusive, taken from the "State of the Ice in the Arctic Seas, 1918," published by the Danish Meteorological Institute.

THE developments of aerial photography during the war seem likely to be put into practical use in peacetime in connection with surveying and cartographic work. In *La Nature* for September 6, P. Dautriche expresses the opinion that the field of application for aero-photography seems to comprise (1) land cartography (revision and explorations); (2) marine cartography or charting; (3) the preparation of large-scale maps and plans for various public works enterprises; and (4) control work (forest sections, the traffic of ports, stations, etc.). His article develops the subject in an elementary way by simple examples of the method of procedure.

A WRITER in *La Nature* (September 6) sketches the development of the French Ministry of Inventions from its inception in 1915. The Department has been responsible, like the British War Inventions Department, for carrying out numerous investigations related to matters of artillery, small arms, lorries, tanks, aircraft, and shipping. One of the most useful inventions which was the outcome of much experiment by Prof. Perrin and his collaborators is a method of acoustic signalling by means of a compressed-air trumpet. The apparatus, which is quite portable, comprises two clarions or bugles having different notes and a compressed-air cylinder. It has a range of several kilometres. Much valuable work was done, too, on the photography of projectiles at extra high speeds. Mention is also made of Prof. Rothé's method of recording wind velocity by means of small anemometers and mills attached to captive balloons, the anemometers closing an electric circuit at intervals of 10 m. of change in wind force.

AN interesting pamphlet has been issued by the Niagara Falls Chamber of Commerce relating to the electro-chemical industries established at the Falls. The power at present utilised amounts to 605,000 h.p., whilst schemes in process of development will absorb a further 420,000 h.p. It is estimated that a total of 2,500,000 h.p., equivalent to more than 16,000,000 tons of coal per annum, may be obtained without impairing the natural beauty of the Falls. The substances produced by the various companies cover a wide range, and include abrasives, refractories, fertilisers, metals and alloys, inorganic compounds, and a variety of organic substances such as chloroform, methyl alcohol, and formaldehyde. When cheap power is available, electro-chemical methods of production often prove cheaper than alternative processes, and to this fact may be attributed the rapid development of hydro-electric schemes in all countries where water-power is available on a sufficiently large scale. The policy of the United States is to utilise water-power to the fullest extent, thereby conserving fuel; and it is worth while considering whether the British Empire could not act as a whole in this connection, particularly in view of the present situation in relation to coal supplies. Judging from the success already achieved at Niagara, it appears probable that a continuously increasing proportion of chemical and metallurgical products will emanate from water-power centres in the future.

WE have received a copy of an interesting pamphlet (obtainable from the editor of the *British Baker*, Messrs. MacLaren and Sons, Ltd., 38 Shoe Lane, E.C., price 1*s*.) by Capt. Robert Whymper on "The Conditions that Govern Staleness in Bread." For the greater part the report deals with work carried out by Capt. Whymper himself as Assistant Inspector of Bakeries with the Army in France, and it extends over far too large a field for complete abstraction here. The questions studied include the estimation and location of losses occurring in the manufacture of bread, the conditions that govern staleness in bread, changes occurring in bread with age, and the colloid nature of bread-crumb. The conclusions arrived at are as follows:—(1) The cooling of bread takes place in three stages: a steam period, a condensation period, and a drying period, the rate of loss of moisture of the first being four times as great as that of the drying period and five times that of the condensation period. (2) No marked loss of moisture from the centre of the loaf occurs until after 100 hours, and within the latter period the zone of drying is a layer only 1 in. thick adjacent to the outer crust. (3) The loss of water from a loaf on keeping is not responsible for staleness. (4) As the loaf becomes stale there is a fall in the amount of soluble extract of the bread-crumb, followed by a rise, the soluble starch falling rapidly between six and twenty-four hours' cooling. This supports Lindet's view that staleness is due to the retrogression of soluble starch. A similar fall and rise of soluble extract has been observed with starch pastes. Capt. Whymper considers that staleness may be attributed to (i) deposition of solid starch in the bread-crumb by change of temperature and accelerated by the pre-existence of solid starch particles; and (ii) partial polymerisation of starch independent of the deposition mentioned, which tends to crumble the gelatinous nature of the bread-crumb. Changes occurring in the proteins of the bread may also be a cause of staleness.

Messrs. Baillière, Tindall, and Cox have in the press for appearance in their Industrial Chemistry Series:—"Explosives," E. de Barry Barnett; "The Industrial Gases," Dr. H. C. Greenwood; "Animal Proteids," H. G. Bennett; and "The Carbohydrates," Dr. S. Rideal. The following volumes are in preparation for the same series:—"Fats, Waxes, and Essential Oils," W. H. Simmons; "Silica and the Silicates," J. A. Audley; "The Rare Earths and Metals," Dr. E. K. Rideal; "The Iron Industry," A. E. Pratt; "The Steel Industry," A. E. Pratt; "Gas-works Products," H. H. Gray; "Organic Medicinal Chemicals," M. Barrowcliff and F. H. Carr; "The Petroleum Industry," D. A. Sutherland; "Wood and Cellulose," R. W. Sindall and W. Bacon; "Rubber, Resins, Paints, and Varnishes," Dr. S. Rideal; and "Economic Fuel Production in Chemical Industry," Dr. H. S. Taylor.

ERRATUM.—On p. 84 of NATURE of September 25, in the Table in column two, 95·4 appeared under S(aturn) in some copies as 5·4, the 9 having been broken off during printing.

OUR ASTRONOMICAL COLUMN.

THE TWENTY-FOUR-HOUR DAY.—The spirit of standardisation and unification is abroad, and one of its latest manifestations is the attempt to reduce the various methods of time-reckoning to a single system. Astronomers have made an important contribution to this end in deciding to commence the astronomical day at midnight instead of noon. This reform will commence in the year 1925, an earlier date being inconvenient for the various nautical almanacs. While astronomers will gain, on the whole, by the change, yet in some respects, notably in the case of sets of observations extending on both sides of midnight, it will cause inconvenience; this gives them a certain claim to ask for some sacrifice on the part of the general public in order to achieve the further unification which is now desired; this is the substitution of 24-hour reckoning for the present system of a.m. and p.m.

Twenty-four-hour time has long been used in Italy; it was introduced into the British Army last year, and a few railway companies already use it in their time-tables, where its convenience is so manifest that it is surprising that its introduction has been so tardy. The majority of social functions take place in the afternoon or evening, and it undoubtedly is somewhat more troublesome to say seventeen than five, or twenty-one than nine. *Punch* made some amusing play on this subject when the reform was suggested in 1885; possibly this had something to do with the failure to carry it at that date. However, the fact that astronomers could not then agree to alter the astronomical day deprived the scheme of its driving-power. The auspices are now more favourable, and the report of the Committee, consisting of seven members, just appointed by the Home Secretary will be awaited with interest.

COMETS.—Using observations made on August 21, 29, and September 7, Messrs. Braae and Fischer-Petersen have deduced the following elliptical orbit of the comet 1919*b*:—

$$T = 1919 \text{ Oct. } 16{\cdot}861 \text{ G.M.T.}$$

$$\left.\begin{array}{l}\omega = 129^\circ\ 32{\cdot}11' \\ \text{☊} = 310^\circ\ 43{\cdot}41' \\ i = 19^\circ\ 11{\cdot}45'\end{array}\right\} 1919{\cdot}0$$

$$\begin{array}{l}\log a = 1{\cdot}23860 \\ \log e = 9{\cdot}98767 \\ \log q = 9{\cdot}68544 \\ \text{Period } 72{\cdot}095 \text{ years}\end{array}$$

The elements are extremely close (within about 5′ in each case) to Gould's elements for 1847 when corrected for precession. The error of the middle place in longitude (great circle) is −0·50′, in latitude +0·51′. The period adopted is simply the observed interval between the two perihelia, uncorrected for perturbations.

Ephemeris for Greenwich Midnight.

	R.A.			N. Decl.		Log *r*	Log Δ	Mag.
	h.	m.	s.	°	′			
Oct. 1 ...	11	46	46	25	14	9·7836	9·7184	6·8
5 ...	11	45	19	20	52			
9 ...	11	46	13	16	46	9·7130	9·8392	7·3
13 ...	11	49	41	12	49			
17 ...	11	55	30	8	55	9·6856	9·9440	7·9

The comet will be observable as a morning object in Europe until early in December; after that it will pass to the south of the sun, and will be better placed for southern observers. It is very desirable to observe it as long as possible, in order to place the elliptical character of its orbit beyond a doubt.

The physical appearances of the three visible comets are discussed in *L'Astronomie* for September. 1919*a* (Kopff) appeared as a circular nebulosity some 3′ in diameter, gradually increasing in brightness towards the centre, where there was a nucleus of the 12th mag.; no trace of a tail. 1919*b* (Metcalf-Brorsen) was visible to the naked eye on September 5, in spite of strong moonlight. In the telescope it appeared as a large nebulosity, with eccentric condensation, and a short but broad tail pointing S.W. 1919*c* (Metcalf-Borrelly) appeared early in September as a pale nebulosity, 2′ in diameter, with slight central condensation; observation difficult owing to moonlight.

MINOR PLANETS.—A sixth member of the interesting Trojan group of planets (the mean motion of which is the same as that of Jupiter) was found in March last, and provisionally designated 1919 FD. Its mean longitude is 60° greater than that of Jupiter. Prof. Cohn gives the following elements:—

Epoch 1919 March 19·5 G.M.T.

$$M_0 = 88^\circ\ 48'\ 18{\cdot}9''$$

$$\left.\begin{array}{l}\omega = 78^\circ\ 46'\ 7{\cdot}8'' \\ \text{☊} = 336^\circ\ 55'\ 10{\cdot}5'' \\ i = 21^\circ\ 56'\ 49{\cdot}8''\end{array}\right\} 1919{\cdot}0$$

$$\phi = 4^\circ\ 55'\ 43{\cdot}4''$$

$$\mu = 303{\cdot}190''$$

$$\log a = 0{\cdot}712194$$

Four of the Trojans have longitude 60° greater than Jupiter, and two 60° less.